

**REMARKS**

Claims 1-16, 24, and 26-28 are now pending in this application. Claims 1-16, 24, 26, and 27 are rejected. Claim 11 is objected to. New claim 28 is added. Claim 1 has been amended to clarify the invention and/or to place it in better form. Claims 2-16 and 24, 26, and 27 have been amended to place them in better form.

The Office Action states that the term "system" has been interpreted as "apparatus". The term system has been replaced with "apparatus" to place the claims in better form.

Claim 11 has been objected to as referring to "the surplus steam". Antecedent basis has been provided to such a term. Claim 11 now reads similar to claim 7 in this regard since claim 7 was not objected to in the Office Action.

Claims 1 and 3-10 have been rejected under 35 U.S.C. § 102(b) as anticipated by JP 10-308230 (Tetsuo).

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *See Verdegaal Brothers Inc. v. Union Oil Company of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Claim 1 has been amended to include many of the limitations of claim 12 directed to the reformer. It is Applicants' position that Tetsuo fails to disclose all of those limitations. Accordingly, it is Applicants' position that claim 1 is patentable over Tetsuo. Claims 2-10 are patentable at least for the reason that they depend from a patentable base claim. *See In re Royka and*

*Martin*, 180 USPQ 580, 583 (CCPA 1974).

Claim 1 has been rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,094,926 (Kobayashi et al.).

“A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.” *See Verdegaal Brothers Inc. v. Union Oil Company of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Claim 1 has been amended to include many of the limitations of claim 12 directed to the reformer. It is Applicants' position that Kobayashi et al. fails to disclose all of those limitations. Accordingly, it is Applicants' position that claim 1 is patentable over Kobayashi et al.

Claims 2 and 11 have been rejected under 35 U.S.C. § 103(a) as obvious over Tetsuo.

To establish a *prima facie* case of obviousness, it is necessary to show that all the claim limitations are taught or suggested by the prior art. *See In re Royka and Martin*, 180 USPQ 580, 583, 490 F.2d 981 (CCPA 1974).

Claim 1 has been amended to include many of the limitations of claim 12 directed to the reformer. It is Applicants' position that Tetsuo fails to disclose or suggest all of those limitations. Accordingly, it is Applicants' position that claim 1 is patentable over Tetsuo. Claims 2 and 11 are patentable at least for the reason that they depend from a patentable base claim. *See In re Fine*, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988).

Claims 12-16, 24, and 27 have been rejected under 35 U.S.C. § 103(a) as obvious over Tetsuo in view of JP 2001-192201 (Maruko), with an English equivalent of Maruko being U.S. Patent No. 6,506,359.

The claims have been rejected over Tetsuo in view of Maruko. In the rejection, the Office Action relies, *inter alia*, on Figure 5 of U.S. Patent No. 6,506,359. However, the rejection is over JP 2001-192201. Figure 5 of U.S. Patent No. 6,506,359 is not present in JP 2001-192201. Accordingly, it is Applicants' position that the rejection is improper since it refers to Figure 5 of U.S. Patent No. 6,506,359 in a rejection over JP 2001-192201 when such figure is not present in JP 2001-192201.

Almost all of the limitations of claim 12 have been incorporated into claim 1 and, additionally, a limitation about the heat-insulating wall was added.

To establish a *prima facie* case of obviousness, it is necessary to show that all the claim limitations are taught or suggested by the prior art. *See In re Royka and Martin*, 180 USPQ 580, 583, 490 F.2d 981 (CCPA 1974). Claim 1 recites, *inter alia*, that a heat-insulating wall portion is provided on the partition wall in contact with the mixed catalyst bed in the second reaction chamber. Tetsuo in view of Maruko fails to disclose or suggest this limitation. Accordingly, claim 1 and by dependency, claims 13-16, 24, and 27 are patentable. An explanation of the distinction over the applied art follows:

In the second reaction chamber as recited in claim 1, the reforming reaction

of the mixed catalyst bed arranged in the second reaction chamber exhibits an endothermic reaction. As a result, it is desirable to suppress heat dissipation from the surroundings of the mixed catalyst bed to the outside in order to increase reforming efficiency. On the other hand, the shift catalyst bed arranged in the second reaction chamber exhibits an exothermic reaction. As a result, in order to prevent degradation of the shift catalyst, it is desired to promote the heat dissipation from the surroundings thereof to the outside to lower the temperature of the shift catalyst bed.

Further, since the reforming reaction of the steam reforming catalyst bed in the first reaction chamber exhibits an endothermic reaction, it is desired to receive external heat supply.

In claim 1, in order to meet these various mutually contradictory requirements of respective sections, the first reaction chamber and the second reaction chamber are separated from each other by the heat-conductive partition walls, and the heat insulating walls are provided only in the portion of the partition walls in contact with the mixed catalyst bed. The heat dissipation from the surroundings of the mixed catalyst bed to the outside is suppressed by the heat insulating walls.

Moreover, since the shift catalyst bed is arranged facing the first reaction chamber via the heat-conductive partition walls, heat energy of the heat-transfer particle bed accumulated by adsorbing heat from the reformed gas is transferred

to the steam reforming catalyst bed via the heat-conductive partition walls, promotes its temperature rise, and acts so as to enhance steam reforming efficiency in the first reaction chamber.

Thus, the reformer as recited in claim 1 has the effects of enhancing the steam reforming efficiency, preventing the degradation of the shift catalyst bed, and also increasing heat energy efficiency. These resulting effects are not to be expected from the applied references.

Claim 12 recites a heat-transfer particle bed between the mixed catalyst bed and the shift catalyst bed. The Office Action refers to item 24 in Maruko as a heat-transfer particle bed. However, item 24 in Maruko is a high temperature shift catalyst bed. The Office Action has cited to no disclosure of a heat-transfer particle bed in Maruko.

Moreover, by providing the heat-transfer particle bed, the reformed gas outflowing from the mixed catalyst bed is cooled and the resulting reformed gas at a lower temperature flows into the shift catalyst bed. Thus, the decrease in activity and the degradation of the shift catalyst can be prevented. Also, since heat energy of the heat-transfer particle bed is heat-transferred to the steam reforming catalyst bed in the first reaction chamber via the heat-conductive partition walls, the steam reforming catalyst in the first reaction chamber can be heated.

Claim 13 further recites that the first reaction chamber is packed with a heat-transfer particle bed at the raw material feed section side, and a steam

reforming catalyst bed at the discharge section side. Meanwhile, the heat-transfer particle bed in the first reaction chamber and the shift catalyst in the second reaction chamber are arranged facing each other via the respective partition walls.

Thus, by arranging the heat-transfer particle bed in the first reaction chamber and the shift catalyst bed in the second reaction chamber facing each other, the heat energy of the shift catalyst bed is efficiently transferred to the heat-transfer particle bed in the first reaction chamber. Thus, the temperature rise of the shift catalyst bed is suppressed, and the mixture of raw material gas and steam supplied to the first reaction chamber is subjected to a temperature increase by heat energy that the heat-transfer particle bed has received, and the reforming efficiency in the steam reforming catalyst bed is further enhanced.

Accordingly, at least for the aforementioned reasons, it is respectfully requested that the claims of the present application be allowed.

Claim 1 has been amended to clarify the invention and/or to place it in better form. Claims 2-16 and 24, 26, and 27 have been amended to place them in better form. New claim 28 has been added. Support for the claim amendments can be found in, for example, the claims as filed, and in the specification on page 29, first full paragraph, and on the paragraph bridging pages 32-33, and in Figure 3.

Applicants respectfully request a one month extension of time for responding to the Office Action. **The fee of \$120.00 for the extension is provided**

**for in the charge authorization presented in the PTO Form 2038, Credit Card Payment form, provided herewith.**

If there is any discrepancy between the fee(s) due and the fee payment authorized in the Credit Card Payment Form PTO-2038 or the Form PTO-2038 is missing or fee payment via the Form PTO-2038 cannot be processed, the USPTO is hereby authorized to charge any fee(s) or fee(s) deficiency or credit any excess payment to Deposit Account No. 10-1250.

In light of the foregoing, the application is now believed to be in proper form  
for allowance of all claims and notice to that effect is earnestly solicited.

Respectfully submitted,  
JORDAN AND HAMBURG LLP

By C. Bruce Hamburg  
C. Bruce Hamburg  
Reg. No. 22,389  
Attorney for Applicants

*By* and,

By Ricardo Unikel  
Ricardo Unikel  
Reg. No. 52,309  
Attorney for Applicants

Jordan and Hamburg LLP  
122 East 42nd Street  
New York, New York 10168  
(212) 986-2340

enc: Form PTO-2038